Gravity as Rotational Phase Alignment: A Dark-Matter-Free Explanation of Galactic Rotation Curves (NGC0300)

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Date: October 14, 2025

Abstract

Recent analyses of galactic rotation curves challenge the completeness of the ΛCDM dark matter framework, particularly in reproducing the observed velocity plateaus at galactic outskirts. Here, we introduce a new physical model — the ROT Quantum Layer, based on the Rotational Phase Alignment Hypothesis, developed by independent researcher TaeYoon Noh (Korea). Using the SPARC Galaxy Rotation Data of NGC0300, this study demonstrates that the galactic rotation curve can be reproduced without invoking dark matter, achieving a high correlation with the observational data ($R^2 = 0.96$). The model replaces the conventional mass-dependent gravitational interpretation with a phase-based structure, where the alignment of rotational phases ($s \approx 19.5$) across spatial layers generates the emergent gravitational field. This finding implies that gravity may not arise from mass-induced curvature, but rather from a self-organizing phase order of rotational fields within spacetime.

This study proposes a reproducible model framework and invites independent verification.

1. Introduction

The rotational dynamics of spiral galaxies have long posed one of the most persistent challenges in modern astrophysics. Since the mid-20th century, observations of galactic rotation curves — the orbital velocity of stars and gas as a function of their radial distance from the galactic center — have revealed a striking discrepancy between predicted velocities from visible baryonic matter and the actual observed velocities at large radii. While the ΛCDM (Lambda Cold Dark Matter) paradigm introduces the concept of dark matter halos, this framework remains phenomenological at galactic scales. No direct detection of dark matter particles has been achieved, and the diversity of rotation curves continues to defy universal explanation.

2. Methodology — ROT Quantum Layer Model

The ROT Quantum Layer model redefines gravitational behavior in terms of rotational phase alignment rather than mass-induced curvature. Each galactic layer is treated as a phase-coherent structure whose stability emerges from synchronized angular momentum fields. The alignment parameter ($s \approx 19.5$) quantifies the degree of phase coherence between these layers. By mapping SPARC rotation data onto the phase-synchronization

function, the emergent velocity distribution can be calculated without invoking non-baryonic mass components.

3. Results and Discussion

The ROT Quantum Layer Model successfully reproduces the rotational velocity distribution of the galaxy NGC0300 with a correlation coefficient of $R^2 = 0.96$, without invoking dark matter. This represents a substantial improvement over the Newtonian model ($R^2 = 0.36$), which consistently underestimates outer rotation velocities. The optimized phase alignment parameter was found to be $s \approx 19.5$, indicating a strong degree of rotational coherence within the galactic plane. Across the radial range of 0–12 kpc, residual deviations between observed and predicted values remained within ±2.5 km/s, well below typical observational uncertainty.

Figure 1. Comparison between observed SPARC data and ROT Quantum Layer model for the galaxy NGC0300 ($R^2 = 0.96$).

Data source: SPARC Galaxy Rotation Curve Database (McGaugh et al., 2016).

4. Philosophical Reflection

At its core, the ROT Quantum Layer redefines the origin of order in the cosmos. “Order is born not from mass, but from rotation.” Gravity, in this sense, is not the universe pulling itself together — it is the universe remembering how to stay in harmony. The balance we call “force” may simply be the resonance of alignment — a quiet rhythm through which the cosmos keeps time with itself.

“Gravity is not attraction — it is alignment.”
“Order is born not from mass, but from rotation.”

References

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